Nov. 16, 1937. J. R. BALLARD 2,099,188

PORTABLE ROOM COOLING APPARATUS

Filed Oct. 23, 1931

FIG. 1.

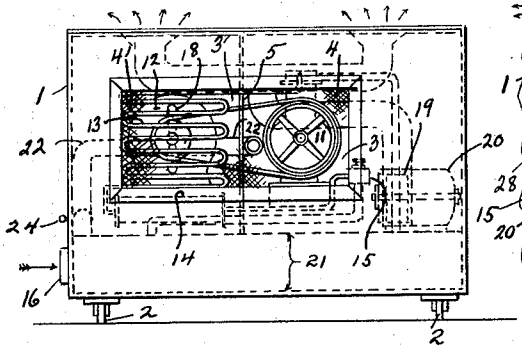


FIG. 2.

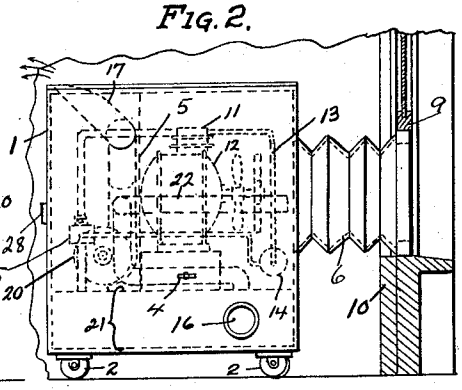


FIG. 3.

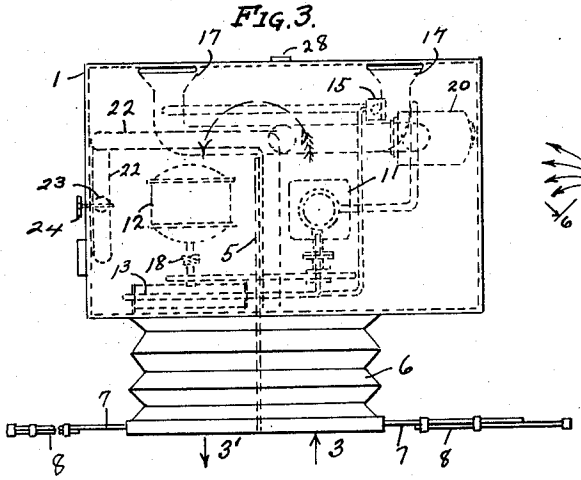
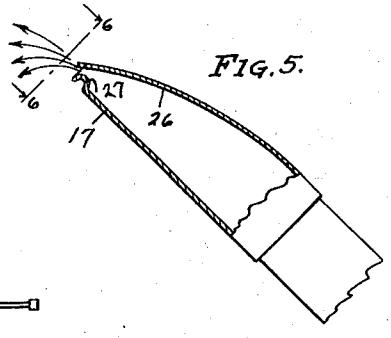


FIG. 5.



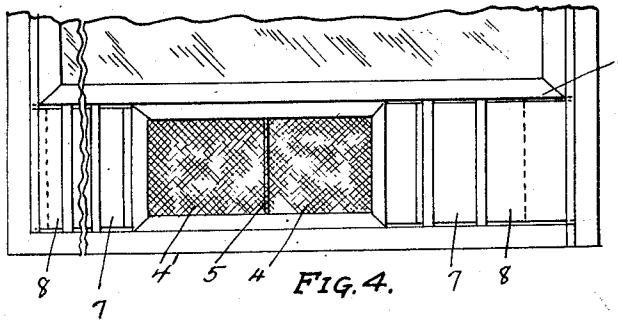
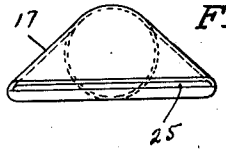


FIG. 4.

FIG. 6.



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PORTABLE ROOM COOLING APPARATUS

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Application October 23, 1931, Serial No. 570,643

18 Claims. (Cl. 62—129)

This invention relates to refrigerating apparatus and has for its objects a room cooling machine which may be located adjacent a partly opened window or other opening in the wall of a desired enclosure and set in motion to cool the air of the room while discharging the heat of compression to the outer air. Other objects of the invention will appear in the following description and accompanying drawing.

In the drawing Fig. 1 is a rear elevation of the apparatus with the principal features of the machinery within the case dotted in position and shown in full lines through the ventilating screens which are broken away.

Fig. 2 is a side view of the machine with its bellows extended to a partially opened window for taking in cool air and passing out heated air circulated around the machinery.

Fig. 3 is a plan view of the apparatus.

Fig. 4 is an elevation of part of the window of the house, as seen from outside of the window and showing the air screens.

Fig. 5 is an enlarged longitudinal section of one of the air expansion nozzles.

Fig. 6 is a front view of the nozzle of Fig. 5.

In further detail the apparatus shows at 1 a cabinet or casing preferably supported on casters 2 for easy rolling about a room. Within the cabinet is an air-cooled conventional form of mechanical refrigerating apparatus though specially arranged to receive and discharge its circulation air through openings 3, 3' in the side of the cabinet and respectively covered by wire mesh screens 4, 4' or equivalent. The two ventilating openings are separated by a vertical partition 5 and which extends through and divides the space within an extensible, collapsible conduit preferably in the form of a bellows 6, the outer partition 5 being of cloth or otherwise made extendible so as to conform to the bellows so that the bellows when not in use can be folded against the side of the cabinet.

At the outer end of the bellows is a frame 7 arranged with sliding portions 8 so that it may be extended to fit snugly within the space under a partly raised common window sash 9 in the side wall 10 of the room. Obviously the frame may be fitted in any other desired opening in the wall of the room.

The conventional apparatus which is especially arranged within the cabinet comprises a gas compressor 11 driven by an electric motor 12, the compressor delivering the compressed gas to a condenser coil 13 which in turn delivers to a small liquid storage tank 14 and thence to an expansion valve 15 controlled by a thermostat, not shown, and from where the gas expands into suitable coils, not shown, in air-cooling chamber in an inner cabinet 21 mounted at the bottom of the main cabinet 1. This cabinet or casing takes in air from the room for cooling through an opening 16 near the bottom of the cabinet and delivers cooled air to the room through a plurality of special nozzles 17 shown best in Figs. 5 and 6 to be explained more fully hereafter.

The particular arrangement of parts within the casing 1 constitutes an important feature of the invention, and it should be noted that the compressor and condensing coil are substantially on a level so as to be respectively opposite the openings 3, 3' in the wall of the casing so that the circulation air for carrying away the heat of compression enters the opening 3, passes over and around the compressor to return in back of the partition 5 as denoted by the large arrow in Fig. 3 for passage over the motor 12 and forcing by a fan 18 through coil 13 and out through opening 3' to the outer atmosphere.

The air of the room to be cooled is taken in at 16 through suction of a blower 19 driven by a motor 20 and forced out of the nozzles 17 upward into the room like a spray after the air has been cooled by passing over refrigerating coils located in a separate compartment 21 at the bottom of the cabinet 1. The air-cooling coil is not shown, as any conventional coil may be used, though best results are had with a special air cooling coil as described and claimed in my copending application filed simultaneously herewith under Serial No. 570,641, filed October 23, 1931. Also, for the purpose of adding a percentage of fresh air to the room air being thus cooled, there is a large pipe 22 which extends from the incoming circulation air passage receiving outside air from opening 3, and which pipe opens into the air passage at the air-receiving end of the air-cooling chamber 21 to mix with the room air entering at 16. A damper 23 is arranged in the fresh air pipe so that the percentage of fresh air admitted to the room can be adjusted by turning a knob 24 on the side of the cabinet.

The construction of the air nozzles 17 is highly important in producing an even distribution of cold air in the room without localized chilling and stratification, and after much experimenting I have adopted the form shown in Figs. 5 and 6 and wherein the nozzle 17 has a long narrow slot 25 which extends horizontally, while the

body of the nozzle is directed upward at an angle of about 45° and tapers funnel-like to pipe form. The upper wall of the nozzle rounds down as at 26 to the slot, and just inside of the slot the lower wall is formed with a ridge 27 which rounds downwardly and outwardly to form the lower lip of the slot. This form of nozzle causes the utmost distribution of the cold air as the ridge 27 and downward outer edge causes an eddy and deflection which spreads the cold air over a wide area.

The complete machine includes a thermostat on the casing at 28 exposed to the room air arranged in the well-known manner (not shown) for starting and stopping the machine at the desired temperature point.

Having thus described my improved portable room-cooling apparatus, what I claim is:—

1. A room air cooler comprising a casing adapted to be located in a room, an air-cooled refrigerating set including a gas compressor and a condenser mounted in said casing including an air-cooling means cooled by said set, mechanism adapted to pass air into contact with said air-cooling means and to distribute such cooled air into the room, means for circulating air around the condenser and ejecting it outside of the room, and means for admitting a portion of air from outside said room to the air-cooling chamber for injecting said outside air into the room with the room air cooled therein.

2. A room air cooler comprising a casing adapted to be located in a room, a refrigerating set including a gas compressor and a condenser mounted in said casing including an air-cooling means cooled by said set, mechanism adapted to pass air into contact with said air cooling means and to distribute such cooled air into the room, said mechanism including an air conduit disposed in the casing, said conduit having a portion directed upwardly within the casing and tapering funnel-like into a substantially horizontally extending nozzle provided with a relatively long and narrow air distributing slot disposed at the upper part of the casing for producing an even distribution of cold air in the room without localized chilling or stratification.

3. A room air cooler comprising a casing adapted to be located in a room, a refrigerator set including a gas compressor and a condenser mounted in said casing including an air-cooling means cooled by said set, mechanism adapted to pass air into contact with said air cooling means and to distribute such cooled air into the room, said mechanism including an air conduit disposed in said casing, said conduit tapering outwardly into an air-spreading nozzle which extends upwardly toward the top of said casing at an angle of substantially 45 degrees, said nozzle having an air-distributing orifice of relatively long and narrow dimensions extending in substantially horizontal plane and at the top of the casing whereby to produce an even distribution of cold air in the room without localized chilling or stratification.

4. A room air cooler for a room comprising a portable casing adapted to be located in a room adjacent the window thereof, an air-cooled refrigerating set including a gas compressor, and a condenser mounted in said casing including an air cooling means cooled by said set, and means for cooling the compressor and condenser coils of said set comprising an air conduit having means forming a disconnectible attachment to the window of the room, including instrumentalities for passing air from outside said room through said window and conduit for delivery solely into said casing, said conduit being collapsible so as to permit said conduit to be compactly disposed against the side of the casing, said conduit including an internal partition forming separate inlet and outlet air passages, said partition being collapsible with said conduit.

5. A room air cooler for a room comprising a portable casing adapted to be located in a room adjacent the window thereof, an air-cooled refrigerating set including a gas compressor, and a condenser mounted in said casing including an air cooling means cooled by said set, means for cooling the compressor and condenser coils of said set comprising a flexible air-conducting conduit having a flexible internal partition to provide separate air inlet and a separate air outlet, said conduit having a substantially rigid frame at its outer end for insertion between the window sill and the raised window sash, said flexible partition connecting with said frame.

6. A room cooler comprising a casing adapted to be located in a room, an air-cooled refrigerating set including a gas compressor and a condenser mounted in said casing including an air-cooled means cooled by said set, means for air cooling the compressor and condenser coils including an air conduit arranged to receive and deliver circulating air from a window of the room into the casing and discharging the heated air from the casing out through said window, means for drawing air from the room into said casing and into contact with the air-cooling means therein and for projecting said cooled air into the room, and means for drawing outside air through said window and through said air conduit and for mixing the same with the air passing over said cooling means.

7. A room cooler comprising a casing adapted to be located in a room, an air-cooled refrigerating set including a gas compressor and a condenser mounted in said casing including an air-cooled means cooled by said set, means for air cooling the compressor and condenser coils including an air conduit arranged to receive and deliver circulating air from an opening of the room connecting with outside air into the casing and discharging the heated air from the casing out through said opening, means for drawing air from the room into said casing and into contact with the air-cooling means therein and for projecting said cooled air into the room, means for drawing outside air through said opening and through said air conduit and for mixing the same with the air passing over said cooling means, and means for varying the volume of fresh air from outside said opening which is mixed with the air passing over said cooling means without varying the volume of fresh air passing over the compressor and condenser coils.

8. A room air cooler for a room comprising a casing adapted to be located in a room, an air-cooled refrigerating set including a gas compressor and a condenser mounted in said casing including an air cooling means cooled by said set, means in said casing forming an air passage about said compressor and condenser coil, the side wall of said casing having openings registering with said air passage and having a laterally extending tube enclosing said opening and providing a detachable connection with a window opening, means for circulating the air from outside of said window through said tube into said passage about the compressor and con-

denser coils and for discharging the heated air through said tube and out through said window opening, means forming a separate passage in said casing, said passage having an inlet to said room, said second passage including the air cooling means of said refrigerating set, said second passage terminating in means for projecting the cooled air into the room, and a third passage in said casing having one end disposed at the opening and in registration with the tubular conduit connecting to the window and having the other end discharging into said second mentioned conduit for the purpose of admixing a desired volume of fresh air with the air that is drawn from the room and that is cooled and projected back into the room.

9. A room cooler comprising a casing adapted to be located in a room, said casing having its bottom portion arranged to provide an air cooling chamber having an inlet passage connecting with the room, and an outlet passage extending upwardly and terminating in means adapted to project air into the room, a blower associated to project air passing through said air passageway into the room, an air-cooled refrigerating set comprising a compressor and a condenser disposed in said casing above said air cooling compartment, the wall of the casing opposite said condenser and compressor being apertured to provide an air inlet and an air outlet, a tubular conduit connecting said air inlet and said air outlet with the opening in the window, and a fan disposed in said casing for causing a circulation of air through said window, through said air inlet and about the compressor and condenser and thence out through said outlet and through the window, said set including an evaporation coil disposed in the first air-cooling chamber for cooling air passing therethrough, and a fresh air conduit disposed in said casing and having an open end terminating at the inlet opening and connecting with the tubular fresh air conduit, said fresh air conduit discharging inside of said casing into the first mentioned air cooling chamber, control means for governing the volume of fresh air discharged in said air-cooling conduit.

10. A room cooler comprising a casing adapted to be located in a room, said casing having its bottom portion arranged to provide an air cooling chamber having an inlet passage connecting with the room, and an outlet passage extending upwardly and terminating in means adapted to project air into the room, a blower associated to project air passing through said air passageway into the room, an air-cooled refrigerating set comprising a compressor and a condenser disposed in said casing above said air-cooling compartment, the wall of the casing opposite said condenser and compressor being apertured to provide an air inlet and an air outlet, a tubular conduit connecting said air inlet and said air outlet with the opening in the window, and a fan disposed in said casing for causing a circulation of air through said window, through said air inlet and about the compressor and condenser and thence out through said outlet and through the window, said set including an evaporation coil disposed in the first air-cooling chamber for cooling air passing therethrough, a fresh air conduit disposed in said casing and having an open end terminating at the inlet opening and connecting with the tubular fresh air conduit, said fresh air conduit discharging inside of said casing into the first mentioned air cooling chamber, control means for governing the volume of fresh air discharged in said air cooling conduit, and a thermostatically controlled expansion valve mounted in said casing and forming a part of said refrigeration set.

11. A room cooler comprising a casing adapted to be located in a room, said casing having its bottom portion arranged to provide an air cooling chamber having an air inlet passage connecting with the room and having an outlet passage extending upwardly within the casing and terminating in an air nozzle, a blower in said air passage for projecting the air into the room, an air cooled refrigerating set comprising a compressor mounted in said casing above said air cooling chamber, and a motor spaced from said compressor and mounted above said air cooling cabinet, said motor having its driving axis parallel with the driving axis of the compressor, and driving means from the motor shaft to the compressor, a fan on the motor shaft, and a condenser coil connecting with the compressor and disposed in the path of the forced draft created by the fan, the wall of said casing opposite said fan and opposite said compressor being apertured to provide an air outlet and an air inlet respectively, said casing having a laterally extending tubular conduit enclosing the apertures thereof, said tubular conduit having a frame on its outer end adapted to be fitted into the opening of a window when the sash is raised, means providing a partition for said casing and said conduit for causing the fan to draw air in through the window thence through the inlet passage of said conduit, thence through said compressor and about said condenser coils and out through said conduit and through said window.

12. A room cooler for rooms comprising a casing adapted to be located in a room, an air-cooled refrigerating set including a cooling coil in said casing and a condenser and compressor in said casing but insulated from the cooling coil, means for circulating air from the room about the cooling coil and thence back into the room, means for passing outside fresh air into said casing about the condenser and compressor and for discharging the heated air outside the room, and means for passing a portion of the fresh air admitted to said casing about the cooling coil.

13. A room cooler for rooms comprising a casing adapted to be located in a room, an air-cooled refrigerating set including a cooling coil in said casing and a condenser and compressor in said casing but insulated from the cooling coil, means for circulating air from the room about the cooling coil and thence back into the room, means for passing outside fresh air into said casing about the condenser and compressor and for discharging the heated air outside the room, and means for passing a portion of the fresh air admitted to said casing into said room for adding a percentage of fresh air to the room.

14. A room cooler comprising a casing adapted to be located in a room, an air-cooled refrigerating set including a gas compressor and condenser mounted in said casing including an air-cooled means cooled by said set, means for air cooling the compressor and condenser coils including an air conduit arranged to receive and deliver fresh air from an opening of the room into the casing and for discharging the heated air from the casing out through said opening, means for drawing air from the room into said casing into contact with the air-cooling means therein and for projecting said cooled air back

into the room, and means for drawing outside fresh air through said opening and through said air conduit and for mixing the same with the air passing over said cooling means.

15. A portable room cooler comprising a casing adapted to be located in a room opposite a window, said casing inclosing an air-cooled refrigerator set including a gas compressor and condenser disposed in a chamber of the casing, and an air-cooling means cooled by said set disposed in a separate chamber of the casing, said compressor and condenser coil being located substantially on the same level and at a level substantially registering with the bottom of a window opening of the room, said first-mentioned chamber of the casing having an opening opposite the compressor and condenser, said opening being disposed at the level of the bottom sash of the casing, and a collapsible hollow conduit disposed about the margins of said opening, said conduit having means at its outer end for disposal under the window sash when raised for permitting the outside air to go through the window, through the conduit and into the chamber about the compressor and condenser and for passing back out through the window, means for causing a circulation of said air through said conduit, and means for passing air from the room about the cooling coil and for passing the cooled air back into the room.

16. A room cooler unit comprising a refrigerant evaporator and air duct therefor, a refrigerant condenser and air duct therefor, means for effecting circulation of room air over said evaporator, means for effecting inflow of outside air over said condenser and then to the outside for conducting condenser heat to the outside atmosphere, and ventilating means for supplying fresh outside air to the room air as it passes through the unit.

17. A self-contained room cooler unit adapted to be placed in a room adjacent a window or other suitable opening in the room wall comprising, in combination, a refrigerant evaporator, means for effecting circulation of room air over said evaporator to cool the room air, a refrigerant condenser, and means for effecting flow of exterior air through the window and over the condenser and thence out through the window to conduct away the condenser heat including ventilating means adapted to supply to the room air fresh air diverted from the stream of condenser cooling air.

18. A room cooler unit comprising a refrigerant evaporator and air duct therefor, a refrigerant condenser and air duct therefor, means for effecting circulation of room air over said evaporator, means for effecting inflow of outside air over said condenser and then to the outside for conducting condenser heat to the outside atmosphere, and ventilating means for diverting air from the stream of condenser cooling air and admitting the diverted air to the room air at a point before the room air flows over said evaporator, thereby cooling the fresh air before entering the room.

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